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AIRCRAFT CIRCULARS
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 168

SPARTAN "CRUISER" COMMERCIAL AIRPLANE (BRITISH)
A Six-Seat Low-Wing Cantilever Monoplane

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SPARTAN "CRUISER" COMMERCIAL AIRPLANE (BRITISH)*

A Six-Seat Low-Wing Cantilever Monoplane

A six-seater which has recently made its appearance is the new three-engine monoplane produced at Cowes by Spartan Aircraft, Ltd., and to be known as the Spartan "Cruiser." (Figs. 1, 2, and 3.)

Fitted with three De Havilland "Gipsy III" inverted engines, the "Cruiser" carries, when equipped for passenger work, five passengers in addition to the pilot. This represents a power of 72 horsepower per paying passenger, which cannot be regarded as excessive in view of the good performance of the airplane. When the cabin furnishings are removed and the "Cruiser" used as a freight carrier, the pay load becomes 1,000 pounds, or 2.78 pounds per horsepower, for an endurance of 6 hours and a cruising range of approximately 700 miles. If the range is shortened, the pay load is, of course, correspondingly increased. As the airplane has been designed to, and actually does, fly on any two of its three engines, it should cruise at a power expenditure low enough to ensure that engine failure should be almost unknown, and forced landings to all intents and purposes eliminated.

The ratio of gross weight to tare weight is always worth examining, as it represents to some extent the "structural efficiency" of the aircraft. For the Spartan "Cruiser" as a passenger airplane the ratio is 1.53, and for the freight carrier it is 1.65. Both figures must be regarded as good, and indicate that considerable engineering skill has been brought to bear on the structural design.

The aerodynamic efficiency also appears to be above the average. The Everling "high-speed figure" $\eta/2k_D$ has a value of 20.25, which points to a very low minimum drag coefficient. In appearance the "Cruiser" is certainly "clean," and the performance indicates that there is good

*From Flight, July 22, 1932.

scientific foundation for this impression.

The cabin of the "Cruiser" is very well arranged, with comfortable seats along the sides, a good view through windows in the sides, and excellent lighting through the side windows and the roof lights.

FUSELAGE

The fuselage is of metal construction throughout, and follows closely in principle, although not, of course, in actual shape, the hulls of the "Saro" flying boats. A series of light frames give the fuselage its transverse sections, while the planking or covering is of Alclad, stiffened by longitudinal corrugations spaced several inches apart. The planking is riveted to the frame flanges.

THE WING

The cantilever monoplane wing is of all-wood construction, with two main spars of box section, having spruce flanges and three-ply sides. The wing ribs have spruce flanges and three-ply webs, and the covering is a three-ply skin which assists in providing torsional stiffness. Near the fuselage the wing covering is thickened and stiffened to form a walkway to the cabin door. An aileron crank with its fairing is shown in Figure 4.

TAIL UNIT

The complete tail unit is a duralumin structure covered with doped fabric. The rudder and elevators are provided with horn balances, and tail trimming is by a screw jack operated by a wheel in the pilot's cockpit.

POWER PLANT

The three De Havilland "Gipsy III" engines are mounted two in the wings and one in the nose of the fuselage. (Fig. 5.) If desired, alternative types can be fitted provided they are of reasonably the same power and general type. The engine mountings are of steel tube construction (fig. 6) and the wing engines are faired carefully into the wing surface. As the central engine is rather high

above the ground, it has been fitted with hand-turning gear. The outboard propellers are within reach from the ground, and the outboard engines are therefore started by swinging the propellers.

FUEL SYSTEM

There are two main gasoline tanks, housed in the wing between the main spars, each tank being situated in the wing just behind its engine. Each tank has a capacity of 60 gallons (273 liters), which gives the airplane an endurance of six hours at an economical cruising speed of 110 m.p.h.. When the airplane is used as a passenger carrier the tanks will not normally be filled up, but will contain enough fuel for about four hours' cruising. The tanks are interconnected with large balance pipes. Each engine is provided with a fuel pump which feeds direct to the carburetor. In the event of a pump failing, a cross connection is arranged whereby the engine is supplied by another pump. Fuel content gauges are fitted to each tank.

LUBRICATION SYSTEM

The oil tanks are placed in the fairings behind each engine. (Figure 7.)

LANDING GEAR

The landing gear is of the "split" type and has a wide track (10 feet). The telescopic strut, which runs to the under side of the front spar, is of the "oil-cum-steel" spring type. The bent axle hinges on the center line of the bottom of the fuselage, in line with the front spar, while the radius rod runs to the rear spar. The tail wheel structure is shown in Figure 8.

CONTROLS

Elevator and ailerons are operated by a hand wheel on a hinged column, while the rudder control is a parallel-motion, easily adjustable bar. From the pilot's controls to the various control surfaces the run through the airplane is by rods and cables. Engine controls are conveniently placed, and operate through rods and torque shafts.

CABIN ARRANGEMENT

The fuselage is sufficiently wide to permit of placing the seats along the sides, with a gangway down the center of the cabin. Four of the seats are placed between the wing spars, while the pilot's seat (on the port side) and that of the fifth passenger are in front of the leading edge of the wing. The windows in the sides of the cabin are of triplex, while those in the roof are of celluloid. The side windows are made to slide for ventilation purposes.

Behind the cabin is a large stowage space for luggage.

The main dimensions, areas, etc., are shown on the three-view general arrangement drawings, and the characteristics have been collected in the following table.

CHARACTERISTICS

Dimensions:

Wing span	54 ft. 0 in.	16.45 m
Length, over-all	39 " 2 "	11.95 "
Height, over-all	10 " 0 "	3.05 "

Area:

Wing	436.0 sq.ft.	40.5 m ²
Ailerons	40.3 "	3.74 "
Stabilizer	30.5 "	2.84 "
Elevators	31.5 "	2.93 "
Fin	12.0 "	1.11 "
Rudder	20.0 "	1.86 "

CHARACTERISTICS (cont'd)

Weights (passenger airplane):

Tare	3,400 lb.	1,545 kg
Pilot	170 "	77 "
Five passengers	850 "	386 "
Luggage	100 "	45 "
Fuel for 4 hours	600 "	273 "
Oil	70 "	32 "
Loaded weight	5,190 "	2,358 "

Weights (freighter):

Tare	3,320 "	1,508 "
Pilot	170 "	77 "
Freight	1,000 "	455 "
Fuel for 6 hours	900 "	410 "
Oil	75 "	34 "
Loaded weight	5,465 "	2,485 "

PERFORMANCE

Maximum speed	135 m.p.h.	217 km/h
Cruising "	110 "	177 "
Initial rate of climb	600 ft./min.	3.05 m/s
Ceiling	13,000 ft.	3,960 m

When fully loaded, the airplane will not only maintain height, but will climb with either of the three engines stopped.

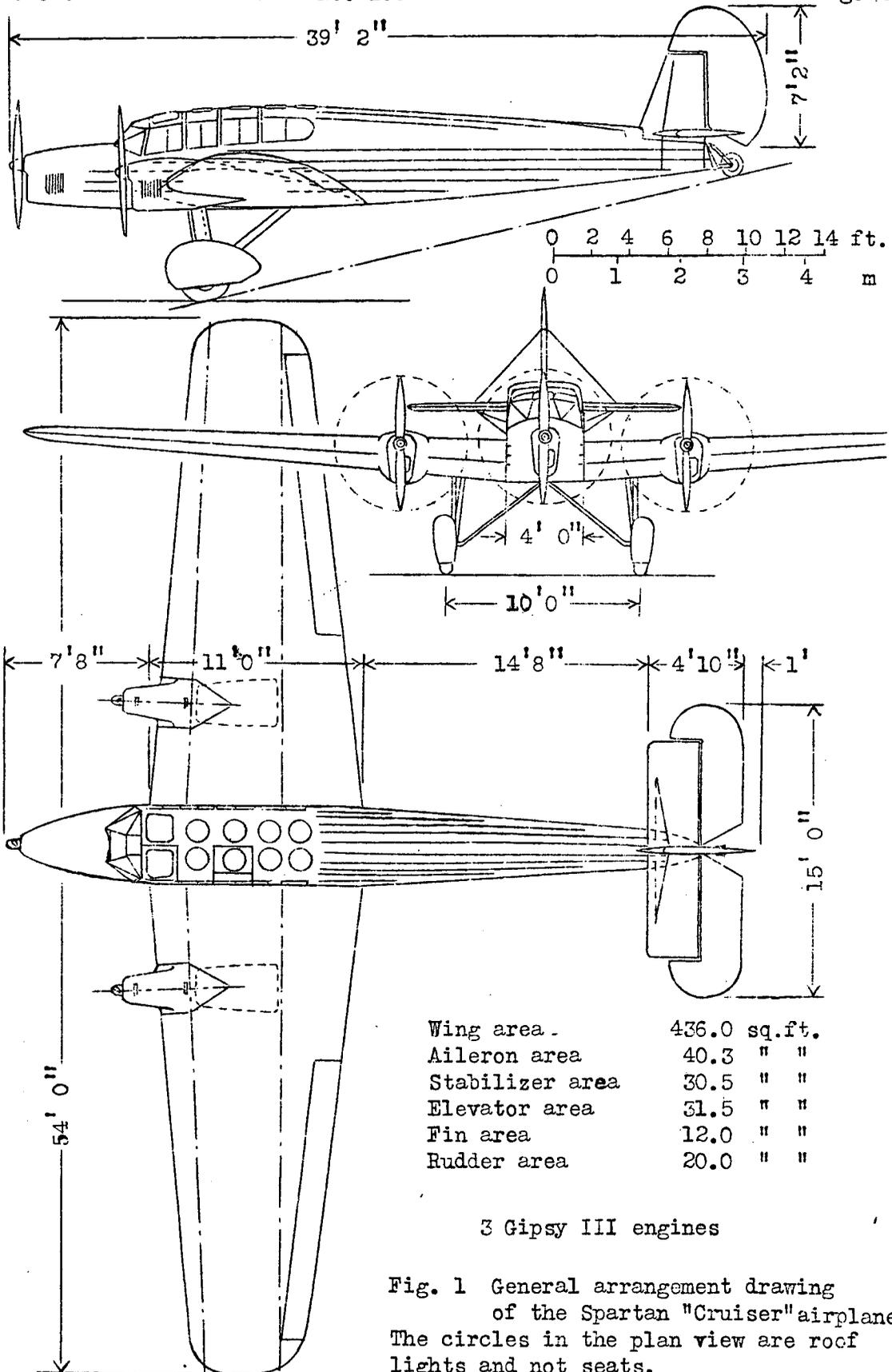


Fig. 1 General arrangement drawing of the Spartan "Cruiser" airplane. The circles in the plan view are roof lights and not seats.

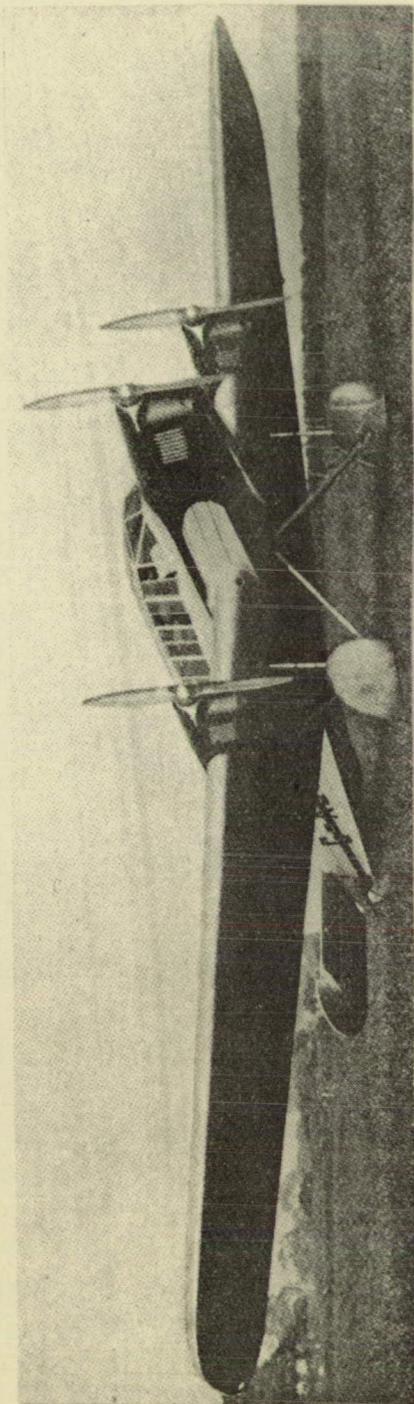


Fig. 2 Three-quarter front view of the "Cruiser".

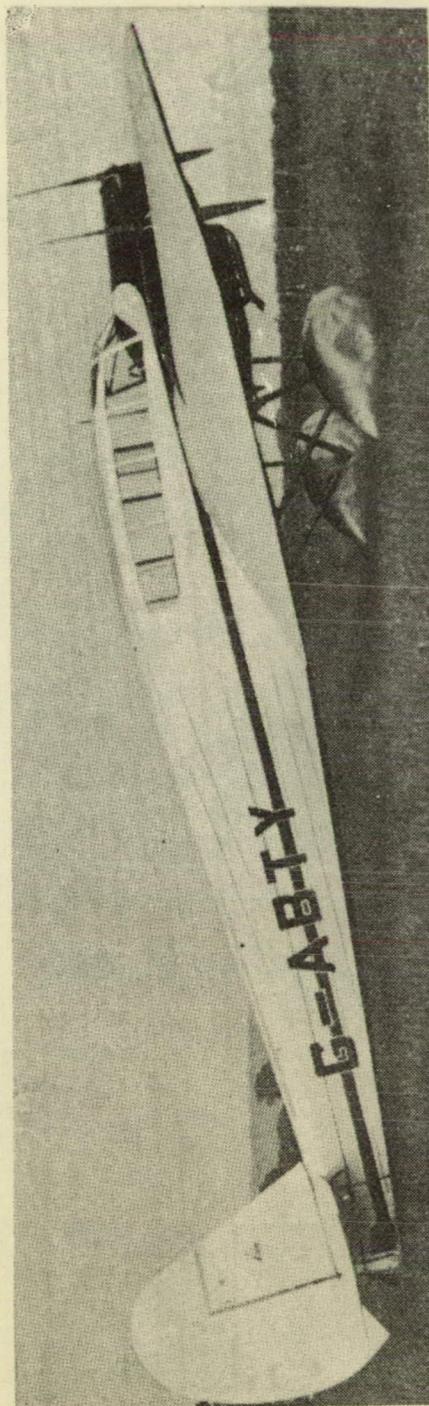


Fig. 3 Oblique-rear view of the "Cruiser".

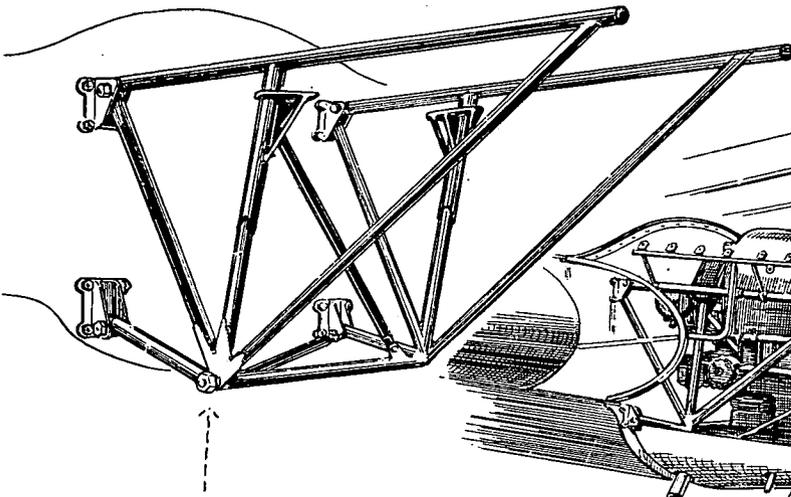


Fig. 6 One of the wing engine mountings

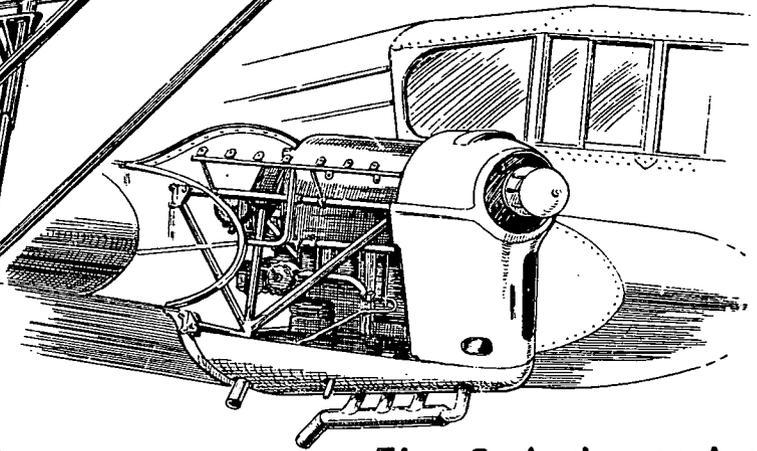


Fig. 5 A wing engine installation

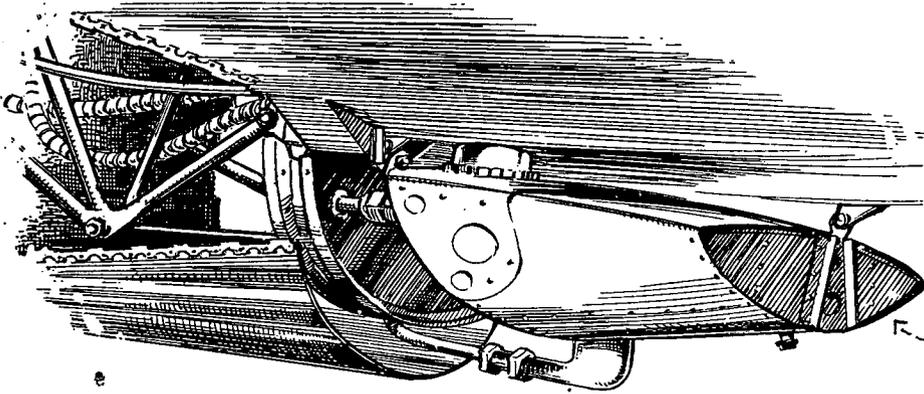


Fig. 4 An aileron crank and its fairing.

Fig. 7 Oil tank of wing engine mounted in fairing behind the engine.

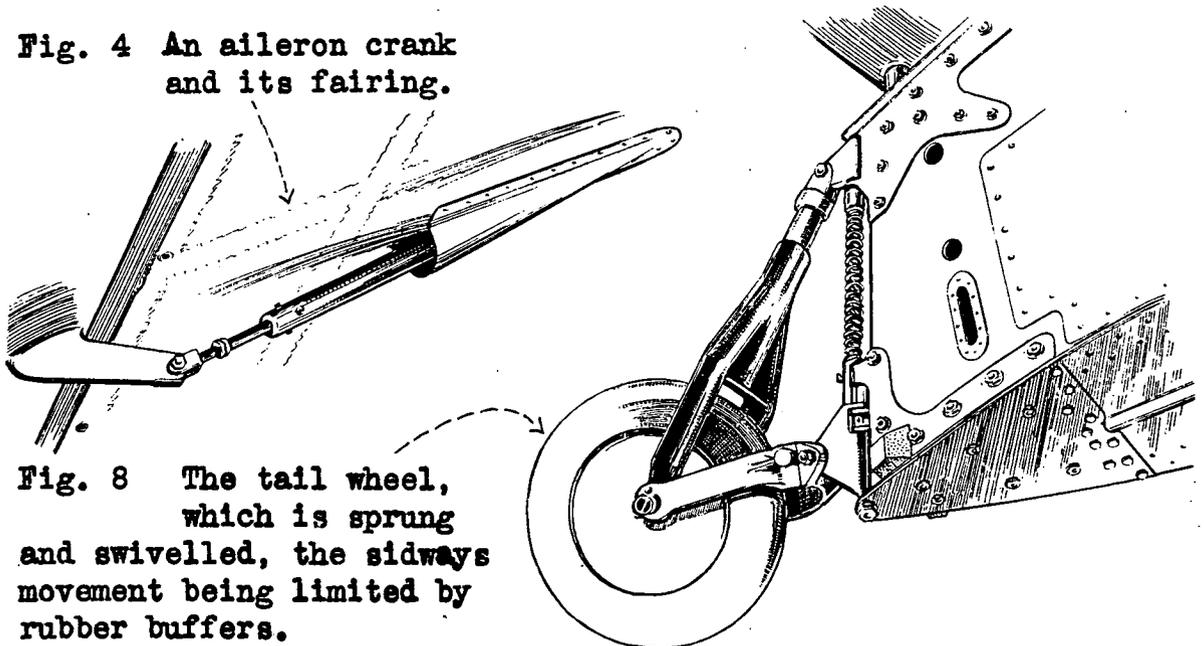


Fig. 8 The tail wheel, which is sprung and swivelled, the sideways movement being limited by rubber buffers.

